

## SwTPC 6800 System Documentation Notebook - Introduction

The SwTPC microprocessor computer system is a complex and sophisticated piece of equipment. This manual assumes that you have a basic knowledge of digital computer operation and some knowledge of, or experience with, machine language and assembler programming. We realize that many customers will not have this type background. It would be impossible to provide a complete course in computer design and programming with this kit. Instead of this one manual we would probably have a ten volume set if we attempted to provide this background information. If you are a beginner in computer technology, we suggest that you check with your local library, or bookstore for books on basic computer operation and programming. The Howard Sams Co. offers several books on computers and BYTE Magazine is another source of good material on computers. You may find that it is necessary to go over some of the material in this manual several times before it starts to make sense. This should not discourage you. By experimenting with programs and checking the results you should be able to work out an understanding of any of the material in this manual. Once you have mastered assembler and machine language programming, you will have an excellent basic understanding of computer operation. Although the instruction sets vary, all computers are similar at this level, all the way up to IBM 370's.

We are supplying a copy of the Motorola "M6800 Microprocessor Programming Manual" as part of the documentation in this kit. This material should be of great help in understanding how to program this system. Parts of the book are written for systems that use the 6800 microprocessor family in dedicated applications; such as process control, etc. These chapters (7, 8 and 9) do not apply to systems such as this kit and should be ignored. Information in chapter

5, as well as appendices A, B and parts of C apply to the SwTPC 6800 computer system.

We suggest that you start your reading in this System Documentation Notebook in the order in which the material is presented making references to specific sections of the "M6800 Microprocessor Programming Manual" when suggested. The introduction of each section within the notebook specifies the order in which the material within the section should be read for best understanding.

A large part of the material in this manual is reprinted from various portions of Motorola Semiconductor Products Inc. M6800 documentation. We would like to thank Motorola for allowing us to supply this material to our customers.

The notebook is divided into five major sections.

- Section I - Hardware
- Section II - Programming
- Section III - Operating System
- Section IV - Software
- Section V - Appendix



## SWTPC 6800 Computer System Addendum

In many places in the SWTPC Documentation a "M6800 Microprocessor Programming Manual" is referred to. This particular manual is no longer available and two replacement manuals, the M6800 Programming Reference Manual and the M6800 CO-RESIDENT Assembler Reference Manual, are being supplied instead. These manuals contain the same information as the programming manual but are published in a different format.

When assembling each of the boards for the computer system, you may find the mounting holes for each of the voltage regulator heatsinks are punched off-center unlike the component layouts which show them centered. You should orient the heatsinks so the body of the voltage regulator transistor lies across the top of the heatsink with maximum contact area. When securing the regulator transistors and heatsinks be absolutely sure the heatsinks do not come into physical contact with any of the foil conductors or component leads on the circuit boards and tighten the mounting screws so the heatsinks cannot be inadvertently turned causing them to short out against nearby conductors.

The IC socket supplied with your kit is somewhat different from the zero force sockets described in the instructions in order to accommodate the new case styles. Note that this socket is not of the zero force variety and does not have the locking bar down the center. To install the IC carefully push the IC down into the socket evenly on both sides. Be careful not to fold over any of the pins.

On the Memory Address Assignment Table (Hex) the last line of the MP-M/MP-MX Memory Assignment Map should read:

Quadrant 4 (4K) IC25 IC39 IC37 IC35 IC33 IC31 IC29 IC27

Please note also that the numbering on the MP-M schematic concerning these IC's is incorrect. IC39, IC37, IC35, IC33, IC31, IC29, IC29, IC27 and IC25 on the schematic should be changed to IC25, IC39, IC37, IC35, IC33, IC31, IC29 and IC27 respectively. These numbering changes can be helpful when trouble-shooting a memory board using the ROBIT diagnostic.

When using the MP-P Power Supply Wiring Diagram take note that switches S1 and S2 are shown upside down. Also note that RESET switch S1 has a "LITE" terminal although nothing should be connected to it.

If you are unable to obtain proper operation of any portion of your kit, it may be returned to our repair department for service. You will be charged a minimum labor fee plus the cost of any parts that must be replaced due to incorrect assembly, or which were damaged in assembly. This minimum fee only applies to kits which have been assembled properly according to our instructions and with acceptable workmanship. Any kits requiring extensive rewiring, or rework will be billed for additional labor.

Label all kits to be serviced "Attention Repair Dept". A short note describing the problem as completely as possible should be included with the kit. Minimum labor charges for the various portions of the kits are as follows:

MP-A Processor Board	\$25.00
MP-M Memory Board (2K or 4K)	\$20.00
MP-C, MP-S, or MP-L Interface Boards	\$10.00
MP-B Mother Board	\$10.00



Before you start programming your 6800 computer system there are a few things you should note:

If you are using interrupts and have a program step sequence where you use a Clear Interrupt Mask, CLI (0E) followed by a Wait for Interrupt, WAI (3E) instruction; the Clear Interrupt Mask, CLI (0E) instruction must be preceded by a No Operation, NOP (01) instruction to insure proper operation.

The SWTPC 6800 Computer System will not RESET during a Wait for Interrupt, WAI (3E) instruction. To reset the system during this instruction you can momentarily unplug the unit or if you don't want to loose the data resident in memory, you can momentarily ground the RESET line on the MP-B mother board. This Wait for Interrupt instruction is functional even if interrupts are not enabled and therefore may be inadvertently executed if you have a program with a bug that causes the processor's program counter to read and execute instructions of random data contained in memory. So if your system ever locks up and won't respond with an \* when the RESET button is depressed, it probably executed a Wait for Interrupt instruction and must be reset using one of the above methods.

Most newer chassis now have four holes punched in the rear to accomodate optional DB-25 RS-232 connectors. Below are the necessary connections to wire up an RS-232 connector if desired. Normally a DB-25S connector will be installed on the computer end (the S denotes the connector with female pins) and a DB-25P connector will be on the terminal end.

<u>Pin #</u>	<u>Computer Connection</u>
1	Chassis Ground
2	RI on MP-C or MP-S
3	RO on MP-C or MP-S
7	MP-C or MP-S ground

The above connections will allow the computer to operate with most commercial terminal systems equipped with a standard RS-232 connector. Some terminals, such as a Texas Instruments, Silent 700 require that pin 4 be connected directly to pin 8 and that pin 8 be connected through a 10K ohm resistor to pin 20. Be sure to check the specifications on your particular terminal for any other necessary lines.

## SwTPC 6800 Computer System/CT-1024 Terminal System Owners

For maximum flexibility, we are recommending that SwTPC 6800/CT-1024 terminal system customers use the CT-CA computer controlled cursor option. This board does everything the CT-M manual board does plus it gives computer program control over cursor positioning. You may even operate the terminal in the "echo" mode and use control characters from the keyboard to position the cursor. This eliminates the need for the multitude of cursor positioning/erase switches required for the CT-M manual cursor board.

To establish software consistency we are recommending you jumper configure your CT-CA computer controlled cursor board as follows:

Control P	(1016)	Home-Up
Control Q	(1116)	Reader On (See Text)
Control R	(1216)	Record On (See Text)
Control S	(1316)	Reader Off (See Text)
Control T	(1416)	Record Off (See Text)
Control U	(1516)	Erase-End of Line (EOL)
Control V	(1616)	Erase-End of Frame (EOF)
Control W	(1716)	Cursor Right

This is in addition to the line feed and carriage functions already incorporated into the main terminal system board.

Control J	(0A)	Line Feed
Control M	(0D)	Carriage Return

The various Reader/Record control functions are used to command our upcoming cassette tape interface. They are the same as those paper tape reader/punch controls used on standard ASR type TTY's. Providing the tape control decoding on the cursor board eliminates the "start read", "cursor down", "cursor left" and "cursor up" functions. Since the screen read function is not used, the "start read" control is unnecessary. The "cursor down" function may be replaced with a "line feed". Since "line feed" and "cursor right" have full screen wrap around, you can work around not having a "cursor left" and "cursor up" by sending sequenced "line feeds" or cursor rights". Note that "cursor right" advances the cursor one line each time it passes thru the 32th character position. This action is cancelled by 15 sequential "line feeds" which is equivalent to a "cursor up".

The recommended cursor positioning sequence is to generate a "home-up" and "erase EOF" (if desired) and then send out ever how may "cursor rights" and "line feeds" necessary to position the cursor to its desired screen location.



